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ASSESSMENT OF FACTORS ASSOCIATED WITH OBESITY IN CHILDREN UNDER FIVE YEARS IN GHANA

BY

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DECLARATION

Except for references to other people's work, which are duly acknowledged, I, Daniel Kofi Darko, declare that this dissertation is my own original research work, and has not been submitted in whole or in part for another degree in this university or in another university.

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……..	……..
Date	Date

DEDICATION

I dedicate this research work to my lovely wife, Joyce Darko and my son, Nyameyie Kwesi Ampem Darko for their support, encouragement and creating a conducive environment at home for me to be able to undertake this research work.

I also dedicate this study to my parents, Kingsley and Comfort Darko for their instrumental role as supporting pillars in my carrier and quest for higher learning.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

AOR	Adjusted Odds Ratio
BMI	Body Mass Index
COR	Crude Odds Ratio
CVD	Cardiovascular Disease
GDHS	Ghana Demographic and Health Survey
GHSERC	Ghana Health Service Ethics review committee
GSS	Ghana Statistical Service
HPPM	Health Policy Planning and Management
IOTF	International Obesity Task Force
OR	Odds Ratio
SPH	School of Public health
UG	University of Ghana
UNICEF	United Nations International Children's Emergency Fund
WDI	World Developmental Indicator
WHO	World Health Organization

ABSTRACT

Background: Childhood obesity or overweight has become a global public health problem with its associated morbidity manifesting in early childhood and progressing to adulthood if the alarming trend is not curbed. The fact is that obesity in childhood is associated with a wide range of serious health complications and an increased risk for premature onset of illnesses, including diabetes, hypertension, and other heart diseases.

Objective: This study examined the factors associated with obesity in children under five (5) in Ghana. This was achieved by determining the prevalence of childhood obesity and assessed socio-demographic, behavioural, environmental and parental predispositions associated with obesity among children under age five in Ghana.

Method: The study used the nationally representative Ghana Demographic and Health Survey (GDHS) 2014 data. An analytical cross-sectional study design was used employing quantitative methods to analyze a secondary dataset comprising 3118 children less than five years captured in the GDHS and corresponding information about their parents in sub-sample household of the male survey. Logistic regression models were applied using STATA version 15.0 to test the strength of association between socio-demographic characteristics, environmental, behavioural and maternal predispositions and the development of childhood obesity. The level of significance was accepted at $p<0.05$.

Results: Prevalence of obesity was 3% among children under five years and the highest regional prevalence (5.3%) was recorded from the Central and Greater Accra Regions. Females were 57% less likely to be obese compared with males [AOR=0.43 (95% CI: 0.26-0.71); $p<0.001$]. Children who belong to obese mothers were 2.33 times more likely to be obese [AOR=2.33 (95% CI: 1.23-4.41); $p=0.009$]. Furthermore, children who were

born to mothers aged 20-24 years were 68% less likely to be obese, compared with children born to mothers aged 15-19 years.

Conclusion: The study highlights the impact of mother's weight status and sociodemographic characteristic on the development of childhood obesity. Interventions and policies to reduce childhood obesity should therefore, be targeted at early identification of familial risk factors.

CHAPTER ONE

INTRODUCTION

1.0. Background to the Study

There is a growing concern about the steady rise in prevalence of childhood obesity globally which is now regarded as a serious public health challenge. Response to this challenge in terms of pragmatic policies aim at curbing this increasing trend has been uneven among many countries (Karnik, & Kanekar, 2012).

Overweight or obesity is described as excessive and unwanted fat accumulation that poses a threat to an individual's health (De Onis, Blössner & Borghi, 2010). There are strong interactions between genetically predisposed individual and the 'obesogenic' environment in the development of childhood obesity (Moreno, Bel-Serrat Santaliestra-Pasías, & Rodríguez, 2013). Obesity usually occurs when the total energy expenditure of the body is less than calories intake which result in the deposition of excess fat (Malik,Willett, & Hu, 2013).

Body Mass Index (BMI) reflects body fatness deduced from an individual's mass in kilogram (kg) and height in meters square (m^2) and it is expressed as the weight of a body divided by the height in square meter (Shah, & Braverman, 2012). BMI is a reliable but indirect estimate of body fatness that offers more accurate outcomes and health-related risks (Ogden, Flegal, 2010). Though it has limitations, it remained the feasible and recognized measure of obesity for screening purpose and medical practice.

An expert committee constituted by the WHO, recommended the use of weight for height Z- score of more than two (+2) Standard Deviation (SD) to classify overweight and Z-score of more than three (+3) SD as obesity in children under 5 years of age (WHO, 1995).

The other widely used reference for the classification of obesity was developed by the International Obesity Taskforce (IOTF). These references were developed following studies in six (6) countries with different socio-demographic characteristics, (Brazil, Britain, Hong Kong, the Netherlands, and the United States) based on BMI cut off in the reference population (Keke *et al*, 2015). Sex-specific BMI curves are mapped at age 18 years to correspond and pass through a BMI value of 25 Kg/m^2 and 30 Kg/m^2 respectively, thus defining age and sex BMI cut off points to classify overweight and obesity in population (Cole, Bellizzi, Flegal, Dietz, 2000).

Currently there is no consensus on which accepted standard classification system to use universally on national levels due to national and international variations in data and as such some countries use their adopted references base on developed guidelines to define cut off points mostly based on BMI .(Gonzalez-Casanova *et al* ,2013). The absence of a standardized references hinders the identification, monitoring, and isolating specific groups for interventions in public health, screening and comparing related studies (Neovius, Linné, Barkeling, Rössner, 2004).

The prevalence of obesity has nearly tripled since 1975 (Pêgo-Fernandes, Bibas, & Deboni, 2011). About 1.9 billion adults, reported by the World health Organization were overweight in 2016, (18 years and above) and, over 650 million of these were obese (WHO, 2018). Studies have observed that most of the world's population lives in countries where overweight and obesity contribute to mortality than underweight (Seidell, & Halberstadt, 2015).

In 2010 it was estimated that 43 million pre-school children were overweight and obese globally and that 92 million were at risk of becoming overweight or obese (De Onis, Blössner, Borghi, 2010). The cumulative prevalence of obesity in children between 1990 and 2010 rose from 4.2% to 6.7% respectively indicating a global surge which is estimated to reach 9.1% representing about 60 million children in 2020 (Wang, Lim 2012).

Overweight and obesity including their risk factors are responsible for the death of 17.8 million adults annually, representing 31% of all death and now considered the leading cause of mortality globally (WHO, 2017).

Childhood overweight or obesity has serious health implications and known to be a major significant risk factor for cardiovascular diseases (CVD) in later years. Studies have shown that the pathological changes that are associated with CVDs start from childhood (Hong, 2010). This is corroborated by a longitudinal study, which reported that risk of developing cardiovascular diseases and its associated mortality is increased in adults who may have been obese in childhood. Childhood obesity may therefore be a major risk factor for adverse cardiovascular health effects (Bao *et al*., 1997). Obesity is also associated with the onset of diabetes mellitus, dyslipidemia, hyperinsulinaemia or insulin resistance and development of high blood pressure (Nadeau, Maahs, Daniels, & Eckel, 2011). Therefore, there is the need to tackle this growing epidemic holistically and in particular, pay attention to the astonishing increasing trends in childhood obesity (Karnik, & Kanekar 2012).

The causes of childhood obesity are multifactorial in its etiology and it is influenced by socio-economic status of parents, feeding practices, genetic predispositions and sedentary

lifestyles amongst others (Ang, Wee, Poh, & Ismail, 2013). The development of childhood obesity has also been linked to other factors such as nutrition, which is important because feeding infants with saturated-fat, energy-dense, refined-sugar and high-salt foods may contribute to childhood obesity (Sahoo, *et al* 2015).

In some studies, childhood obesity was widely attributed to genetic factors, whereas others argue that, the behavioural and environmental factors were the main driving force for developing obesity (Ang, Wee, Poh, & Ismail, 2013). Genetic predispostions have an important influence on BMI variation, but in the presence of common environmental and behavioural factors whose effects are substantial in childhood (Fiese,
Bost, Mcbride , Donovan, 2013).

A study also explained that the effects of built environment on the development of obesity becomes insignificant in adolescence, probably explained by children becoming increasingly independent of their parents and immediate environment, adopting and indulging in more individualistic behaviour (Silventoinen, Rokholm, Kaprio, Sørensen, 2010).

However, it is important to understand the interactions between genetic predisposition and environmental, behavioural and socio-demographic factors; in order to appreciate the aethio-pathogenesis of obesity and how to direct preventable measures to address it
(Sahoo, *et al* 2015). In Ghana, the prevalence of overweight and obesity among urban and rural dwellers was estimated to be 27.2 vs 16.7% and 20.6% vs 8%, respectively (Ofori Asenso, Agyeman, Laar, & Boateng, 2016).

This study focused on the growing menace of childhood overweight and obesity and their determinants in children under five years in Ghana.

1.1. Problem Statement

Globally, the number of children and infants classfied as overweight or obese increased from thirty-two (32) million in 1990 to forty-one (41) million in 2016 (WHO, 2018b). The WHO (2018b) reported that in Low and Middle Income Countries (LMICs), the prevalence rate of obesity in children is 30% more than that of the advanced countries over the last two (2) decades and further revealed that majority of children who are either overweight or obese now resided in LMICs (WHO, 2018b). Available data suggest figures plateauing in most High Income Countries (HICs) in contrast with LMICs where the surge is ongoing (Han, Lawlor, & Kimm,2010). These countries are faced with double burden of dealing with overweight/obesity and undernutrition concurrently. If present developments persist, the population of overweight or obese infants is expected to rise to seventy million by 2025 (WHO, 2018b).

In Ghana, prevalence of obesity amongst children at the University Primary School was estimated to be 10.9% with girls (15.0%) as twice more likely to be obese than boys (7. 2%) of the same age (Mohammed, & Vuvor, 2012). A study in Turkey estimated that in Ankara, the prevalence of childhood overweight and obesity was 21.2% and 14.6% respectively, with a cumulative rate of 35.8% from prior studies estimating the total prevalence of overweight and obesity in Turkish children at 20-25% (Yardim *et al*., 2018). In a related study in Tanzania, data indicated a notable rise in the prevalence of diabetes among children aged 6 to 11 between 1980 and 2008, from 6.5% to 19.6% respectively (Pangani, Kiplamai, Kamau, & Onywera, 2016).

Childhood obesity is linked with a wide spectrum of serious health problems as well as a greater risk for early onset disease, including diabetes, heart related diseases and mental health issues (WHO, 2018b). Obesity was widely considered as a 'western problem', however, available current data shows that overwhelming proportion of children with overweight or obesity reside in developing countries (WHO, 2017).

Studies have shown that socio-cultural setting, environmental factors, and behavioural patterns are crucial in the rising prevalence of obesity globally (Dehghan, Akhtar-Danesh, & Merchant, 2005). Birch and Davison (2001) concluded that children whose mothers are obese and from low socio-economic status have significantly elevated risks for developing obesity, independent of other demographic and socioeconomic factors.

Socio-demographic characteristics like age, ethnicity, educational level, household income, employment status and geographical locations have been linked in the development of obesity (Bingham *et al*, 2013). Household wealth and higher socio-economic status have long been associated with the development of pediatric obesity until recent studies indicated otherwise (Drenowatz *et al.*, 2010). In a related study on the impact of socio-demographic on childhood obesity, it was noted that in 6-year-old children, overweight and /or obesity was overwhelmingly associated with lower educational level of parents (Gopinath, Baur, Burlutsky, Robaei, & Mitchell 2012).

Keane, Layte, Harrington, Kearney and Perry (2012) reported an increased risk of overweight and obesity, among children from deprived background. These researchers indicated that children from single parents were at significantly higher odds of developing overweight and obesity than those from two parent families.

Children from low Socio-economic status (SES) household are likely to display lower physical activity levels, engage in more sedentary activities with increased screen time and have a higher BMI than their counterpart from a high SES. Wolfenden *et al.* (2011) revealed that the probability of children enrolled in formal childcare being overweight and obese was significantly higher among those whose mothers did not have tertiary education and that about 17% of all children and 25% of native children enrolled in rural and regional childcare facilities in the research region were overweight or obese.

There are many behavioral factors that have been identified as contributing to the growing prevalence of childhood obesity (Rey-Lopez, Vicente-Rodríguez, Biosca, & Moreno, 2008). These factors include but not limited to feeding practices, increased screen time, physical inactivity and many more (Sahoo *et al*,2015). Overweight and greater BMI have individually been linked with skipping breakfast, snacking once or more per week, patronizing fast food, more physical inactivity and sedentary lifestyle of more than 1 hour a day (Macfarlane,Cleland, Crawford, Campbell,& Timperio,2009).

1.2. Justification of the Study

The prevalence of obesity has been measured in different age groups (Kimani-Murage *et al*, 2010). These researches reported in their growth survey involving children and adolescents less than 20 years, that 20% of children aged 1-4 years was stunted; with third of those stunted aged one year. These researchers further observed that, the combine prevalence of overweight and obesity, which was insignificant in boys, was however substantial among adolescent girls, increasing with age and peaking at 20-25% in late adolescence.

A similar study in Europe reported the prevalence of overweight and obesity at 4 years to be ranging from 11.8% in Romania (2004) to 32.3% in Spain (1998–2000) (Cattaneo *et al*., 2010). This calls for the need for studies to examine contributing factors to the growing concern of childhood obesity; this appears to be limited in the literature relating to Ghana. Therefore, this study was one of the many attempts that could be made to address the issue.

A total of 43 million children worldwide, 35 million of whom live in LMICs, was reported to be overweight or obese; in 2010, 92 million were also categorized as preobese or at risk of overweight (WHO, 2010). Youfa and Hyunjung (2012) argued that obesity is associated with many immediate and long-term health risk as well as financial implications for individual families and the society. It is observed that obesity is already accountable for 2-8% of health expenses and an approximately 10-13% of all deaths in areas of Europe, and is expected to even get worse in the United States, reaching 17% by 2030 (WHO, 2013).

A detailed study unearthing the challenges posed by childhood obesity in terms of its relationship with financial status of the individual child's family seems to be missing in the literature on Ghana. Thus, this study was important in the direction towards addressing this gap. Currently the association between socio- economic status (SES) and obesity is complex as suggested by literature (Wang, & Lim, 2012). Wang, and Lim, (2012) further stated that childhood obesity differs by several demographic or environmental characteristics and is bidirectional; obesity may have a negative impact on SES by reducing job and educational opportunities.

The immediate environment in which a child grows has an influence on the choice of food, heating habits, and other sedentary lifestyles contributing to the menace of obesity (Dunton, Kaplan, Wolch, Jerrett, & Reynolds, 2009). It is well established that the eating habits of children are severely impacted by both the physical and social environmental factors (Gubbels *et al*, 2011).

A baby's sense of taste develops in utero and is able to perceive food flavours consumed by the mother through the amniotic fluid (Ventura, & Worobey, 2013). Therefore, food preference is established in utero and persist throughout childhood. Children are more likely to incline to foods that are readily available and accessible in the home (Portella et al, 2012). Despite the evidence that environmental factors could contribute to childhood obesity, there seems to be few studies that had investigated this in the context of Ghana (Mohammed, & Vuvor, 2012). Thus, there was the urgent need to do this in the current study.

Obesity has been shown to clearly demonstrate a familial tendency (Raj, Kumar, 2010). In their study, Raj and Kumar (2010) found that there is an increased odd of becoming obese if either father (2.93), mother (4.66) or both (11.75) are obese in children. These findings highlight the dominant effect of parental obesity on the pediatric obesity. Parental obesity has a strong influence and better predicts obesity in later life than the child's weight status before age of three (3) (Keane, Layte, Harrington, Kearney, & Perry, 2012). Their study revealed that 14.4% of children with normal weight parents was overweight or obese whiles those who had obese parents, about 46.2% was overweight or obese. In another related study, parental obesity in the presence of other factors was significantly associated with child obesity (Hajian-Tilaki, & Heidari, 2013).

Childhood obesity negatively affects children's self-esteem, physical health and psycho-social wellbeing (Pizzi, & Vroman, 2013). It reduces the quality of life experienced by the child and result in poor academic performance as most obese children are bullied in school (Sahoo *et al* 2015). Sahoo *et al*. (2015) further intimated that pathological changes underlying the onset of type 2 diabetes and other CVDs begins in childhood, with childhood obesity identified as an important precursor. This fact, notwithstanding, there appears to be no in-depth study that assessed the determinants of childhood obesity in terms of its relationship with the child's family background in the literature on Ghana. This study was a step towards rectifying this absence of evidence on
Ghana.

Although the prevalence of obesity in children under five years can be estimated from existing demographic and health survey, there is no current study to assess the determinants of obesity in children under age five in Ghana. In this research, the determinants were examined to fill the gap in the literature. The reason is that childhood provides an important period of life and a window of opportunity for health interventions to be initiated as health-related lifestyles are just being formed and its possible to intervene to prevent obesity from developing.

Reflexivity

The researcher is a clinician with wealth of experience in dealing with childhood obesity. This vast of experience gained over the years was brought to bear on the discussion. This helped to limit the imposition of any biased viewpoint that was not based on scientific evidence on the subject matter.

1.3. Objectives of the Study

The objectives of the study were divided according to general and specific as shown below.

1.3.1. General Objective

The general objective of the study was to examine the factors associated with obesity among children under age five in Ghana.

1.3.2. Specific Objectives

The specific objectives were:

1. To determine the prevalence of obesity in children under five years.
2. To examine the association between socio-demographic characteristics of mothers of children under age five and their (child's/children's) obesity status.
3. To assess the association between environmental factors and obesity in children under age five.
4. To examine the association between behavioural factors and obesity in children under age five.
5. To assess the association between mothers' preconception predispositions and obesity among children under age five.

1.3.3. Research Questions

The specific objectives were achieved by addressing the following questions:

1. What is the prevalence of obesity in children under five years?
2. What is the association between socio-demographic characteristics of mothers of children under age five and their (child's/children's) obesity status?

3. What is the association between environmental factors and obesity in children under age five?
4. What is the association between behavioral factors and obesity in children under age five?
5. What is the association between mothers' preconception predispositions and obesity among children under age five?

1.4. Outline of the dissertation

The report of the study is presented according chapters to enable the reader follow accordingly. Chapter one is where the introduction is presented highlighting the background to the study, problem statement, justification, objectives and research questions. Chapter two presents the study's literature review and conceptual framework, examining the concepts forming the basis of the study. Chapter three is where the methods adopted to conduct the empirical study are presented. Here, the researcher's philosophical assumption underlying the choice of the research method, study design, study location, study population, sampling method and sample size formula, study variables, data collection and analysis, and ethical considerations, are currently, presented. Chapter four is where the results obtained from the analysis of the empirical study are presented based on the key variables examined. Chapter five is where the findings of the study are related to existing literature to see how there were similarities or parallels. Chapter six is where the summary of the study, conclusions, contribution to knowledge/recommendations, limitations to the study and future research have been presented.

CHAPTER TWO

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.0. Introduction

The chapter presents the analysis of existing literature on the concepts underlying the current study. There are five (5) sections therein. Section one presents prevalence of childhood obesity, section two presents analysis of studies related to the factors that influence obesity among children under age five. Section three is where the theoretical analysis used to develop the conceptual framework or model was captured.

2.1. Prevalence of childhood obesity

From 4.2% in 1990, the global prevalence of childhood overweight and obesity increased to 6.7% in 2010. And the figure is expected to reach 9.1% or appropriately 60 million, in 2020 if current trends continues (De Onis, Blössner, & Borghi, 2010). Effective and pragmatic action is needed to prevent the childhood obesity epidemic. It requires evidence based on early-life risk factors, which unfortunately is still very incomplete (Isganaitis & Levitsky, 2008). It was estimated that about 20% of children in the United States is overweight, while 11% is obese (Nicklas, Yang, Baranowski, Zakeri, & Berenson, 2003). There is a 1.5-2-fold higher risk of children who are overweight becoming overweight in adulthood as most of them maintain higher BMI up to 20 years of age (Nicklas, Baranowski, Cullen & Berenson 2001).

In 2017, 6.3 million children under the age of 15 years died; with 5.4 million of them under the age of 5 years (WHO, 2018a). Children in sub-Saharan Africa are 15 times more likely to die before the age of 5 years than children in high income countries (WHO,

2018b). Globally, approximately 41 million children under five years are overweight (WHO, 2017). In the WHO African Region alone, the number of overweight or obese children increased from four to nine million between 1990 and 2016 (WHO, 2018b). Figure 2.1 shows the prevalence of BMI above two Standard Deviation (SD) (Equivalent to the 98th Centile) in preschool children in HICs and LMICs (de Onis et al., 2010).

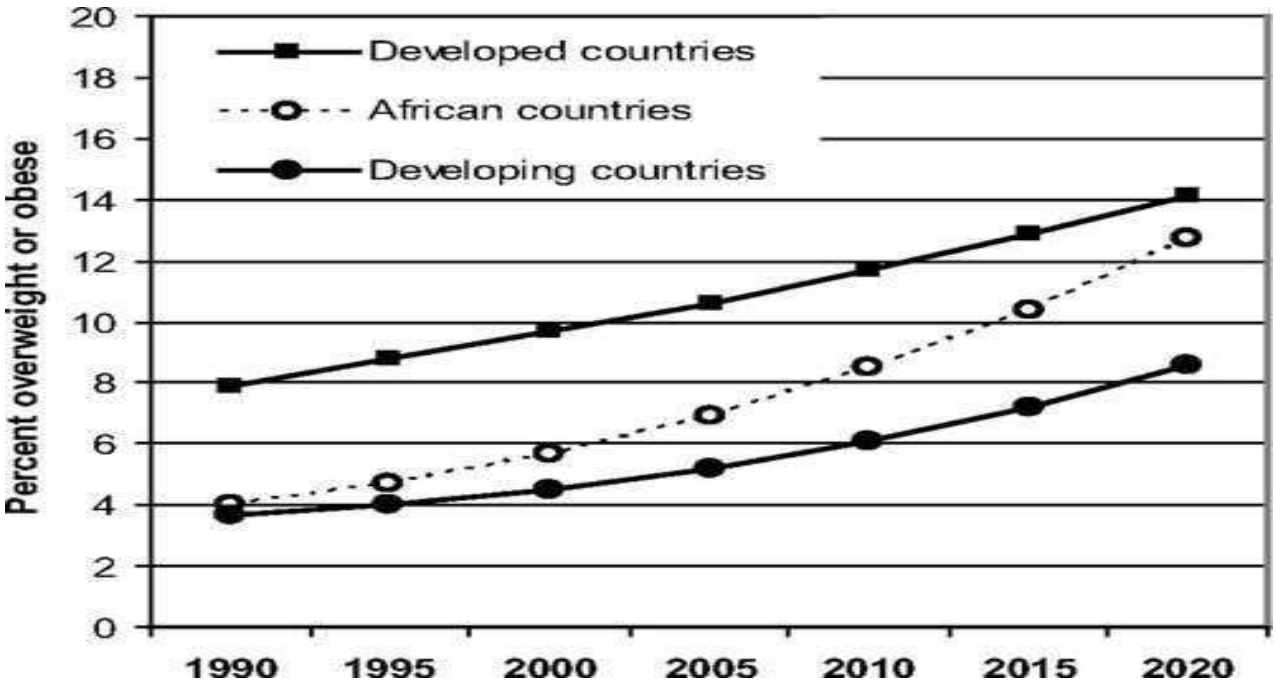

Figure 2. 1: Trends between 1990 and 2010 and predicted ongoing rise from 2010 to 2020 in the prevalence of Body Mass Index

Many chronic metabolic states including dyslipidemia, Type 2 Diabetes, CVDs as well as certain malignancies have been associated with increased BMI. About 30% of coronary heart disease and ischemic cerebrovascular accident cases are were as a result of excess adiposity as reported by the World health organization (Lloyd, Langley, Evans, McMullen, 2012).

2.2. Factors associated with childhood obesity

This section presents analysis of studies related to the factors that influence obesity among children under age five. These factors include the socio-demographic characteristics of mothers of children under age five and their obesity status, environmental factors, behavioural factors and mothers' preconception predispositions.

2.2.1. Socio-demographic characteristics of parents of children under age five and their obesity status

Several studies have associated childhood obesity with some socio-demographic characteristics of the parents and how these characteristics influence choice of food and infant's feeding practices (Fatih, & Gulcan, 2018). A study conducted using the 2013 Turkey Demographic and Health Survey, showed that there was a strong correlation between overweight/obesity and maternal educational level (Fatih, & Gulcan, 2018). Mother's educational level was found to be more consistently associated with a child being overweight or obese than household wealth (Keane, Layte, Harrington, Kearney, Perry, 2012).

Lindkvist, Ivarsson, Silfverdal, and Eurenius, (2015) in their study found a clear correlation between socioeconomic status and obesity; individuals in the lower socioeconomic bracket have a higher odd of being obese. High SES groups in developing countries and low SES groups in advanced countries are at increasing risk of excess weight gain (Wang, Lim 2012).

A study examining the association between mother's employment and children's BMI discovered that an increase in the complete duration of employment of a mother is

associated with a rise in the BMI of her child (Morrissey, Dunifon, Kalil, 2011). Anderson, Butcher, and Levine, (2003) findings in their study show that if a mother worked more hours per week over the life of the child, a kid is more likely to be overweight.

2.2.2. Influence of mother's predispositions on obesity among children under age five

Obesity has been shown in many studies to have a genetic predisposition and some studies suggest that BMI is inheritable. However, familial predisposition can only affect weight gain in the presence of environmental and behavioural obesogenic factors (Sahoo *et al*, 2015).

Studies have reported a strong relationship between parent's obesity status and that of their offspring (Svensson *et al,* 2011). This could be explained as an interaction between environmental and genetic factors contributing to the development of obesity in a genetically predisposed offspring (Birch, & Davison, 2001). Parental obesity status and more especially, maternal BMI during preconception and perinatal periods has been shown to have a significant effect on the development of obesity in children (Gibson, Byrne, Davis, Blair, Jacoby, Zubrick, 2007).

Furthermore, genetic predisposition in the form of parental obesity can only exert a critical and sustained influence on child becoming obese in adulthood in the presence of behavioural and socio-environmental factors (Dubois, Girard, 2006). A study reported that parental obesity was a significant predictor of child obesity (Hajian, Tilaki, & Heidari, 2013). Erem (2015) argues that healthy nutrition in pregnancy is important as it programs the developing fetus to adapt to metabolic conditions in utero.

The impact of parental obesity on the severity of obesity in children is further enhanced as the child progress in to adulthood making the age of obesity onset less important. (Svensson *et al*. 2011)

2.2.3. Influence of environmental factors on obesity in children under age five

Environmental factors play an important role and interact with other factors in the development of childhood obesity. Factors that are out of the control of children surround them and have influence on their food preferences and physical activity can be classified as environmental. Most of the environmental factors are what is described as built environment.

Built environment is made up of variety of social and physical elements encompassing the physical structure of a home, neighbourhood or community that may facilitate excess weight gain (Papas *et al*, 2007). The structural component of a built environment in a residential setting includes housing, shops, green spaces, roads, accessible transportation, walkways and play grounds (Galvez, Pearl, & Yen, 2010).

Ghana has experienced rapid urban growth in the last two decades and is becoming increasingly urbanized with an estimated 50.9 % of the population residing in urban areas (Cobbinah, & Erdiaw-Kwasie, 2018). The rapid rate of urbanization is associated with destruction of green spaces, unplanned housing, reduce physical mobility and promotion of sedentary lifestyle. Sedentary behaviour refers to habitual activities that do not significantly boost energy expenditure above the point of rest and includes activities such as prolong sitting, sleeping, and watching television, and other forms of screen-based entertainment (Pate, O'neill, & Lobelo, 2008). According to WHO, sedentary lifestyle is

one of the most serious yet poorly addressed challenges confronting public health in recent times and estimates that about 60 to 85% of the world's population in both developed and developing countries engaged in sedentary behaviour (WHO, 2002).

It is becoming increasingly evident that the immediate environment of a child has influence on child's access to healthy foods and as well as interest in physical activity (Rahman, Cushing, & Jackson, 2011). Paediatric obesity studies lately are focusing on the role of built environment on energy consumption and expenditure as imbalance between energy consumption and expenditure contribute to adiposity.

Rahman, Cushing, and Jackson, (2011) further observed that community neighbourhood that have access to features such as walkways, accessible transportation, dedicated lanes for bicycle encourages physical exercise. On the other hand, community, where there is easy access to high caloric diets and sugar rich drinks increases the risk of overweight and obesity.

Access to local markets that provide healthy and nutritional food coupled with neighbourhoods that have dedicated places to be active can lead to healthy lifestyles and may help prevent obesity (Sallis,& Glanz, 2006). Neighbourhood conditions represent the wider social and community contexts within which individual behaviours such as physical inactivity, poor diet and sedentary lifestyle might occur, thus leading to increased risk of obesity ((Rahman, Cushing, & Jackson, 2011).

In their study, Singh, Siahpush, and Kogan, (2010) reported that the odds of a child's being obese or overweight was as high as 20–60% among children in deprived

communities with the most unfavourable social conditions such poor housing facilities, absence of recreational centres, inaccessible sidewalks, and unsafe surroundings than among children from neighbourhoods not faced with such conditions.

Acknowledging and understanding the impact of the environment on childhood obesity may provide useful information necessary to develop successful community-based preventive and interventional efforts to curb the growing trends. Interventions should be created from the individual to the neighborhood level, concentrating specifically on the impacts of removing obstacles and improving communities that would promote the removal of obesogenic settings (Booth, Pinkston, & Poston, 2005).

2.2.4. Influence of behavioural factors on obesity in children under age five

Behavioural factors that have influence on childhood obesity includes, breast feeding practices, feeding practices during introduction of complementary feeding, sedentary lifestyles smoking and increased screen time.

Breast milk is the recommended source of food for newborns exclusively for six (6) months and continued up to the age of two (2) years. In addition to its nutritional composition, it confers immunity and promotes bonding between mother and child. Apart from it this important function, Breastfeeding is reported to offer protection against the development of childhood obesity (Bingham *et al*, 2013). A study reported that on the average, breast-fed babies were slightly fatter than those bottled-fed sole or partly during the first month of life. Between the second and the third months, however, the bottle-fed infants had a higher average BMI and skin fold thickness than their counterparts who were breast-fed (Bergmann *et al* 2013). Infants who have been breastfed for at least a year have

lower weight for height values during the second year of life than those who have been breastfed for shorter periods (Gillman *et al*, 2001).

In addition, the risk of childhood obesity in breastfeeding infants was 22% less than those who never breastfed (Yan, Liu, Zhu, Huang, & Wang, 2014). A systematic review involving nine studies with 69,000 participants reported that breastfeeding and childhood obesity have an inverse relationship which indicates a role for breastfeeding in the prevalence of obesity in later life (Arenz, Rückerl, Koletzko, & von Kries, 2004). It further explained that the bioactive substances in breast milk may inhibit adipocyte differentiation in vitro and may cause growth factors to change. Furthermore, protein consumption and energy expenditure is much lower in breastfed compared with infants who were formula-fed (Arenz, Rückerl, & Koletzko, von Kries, 2004).

The mechanism of this protection against childhood obesity can be explained by, breast milk modifying growth factors that inhibit adipocyte differentiation in vitro (Gillman et al, 2001). In addition, breast milk offers the appropriate proportion and quantity of calories and nutrients for infants such as sugar, protein, fats and water (Yan, Liu, Zhu, Huang, & Wang, 2014).

Transition from breastmilk to family diets after 6 months commonly referred to as complementary feeding is an important nutritional transition period. During complementary feeding period, high energy and high of protein consumption, especially animal protein may be associated with an increased BMI in childhood (Pearce, Taylor, and Langley-Evans, 2013).

Wang *et al* (2016) observed that introducing complementary foods before 4 months of age compared to at 4 to 6 months was associated with an increased risk of being overweight. Parental feeding practices have been implicated in many studies as contributing to childhood obesity (Webber, Cooke, Hill, & Wardle, 2010). Parental feeding practices that influences child's eating habits have also been identified as having influence on childhood obesity (Gregory, Paxton, & Brozovic, 2010).

The prevalence of obesity is increased by 2% for each additional hour of television viewing per day (Sahoo et al, 2015). A study in Switzerland found a significant correlation between time spent watching television daily and childhood obesity as was anticipated; with each extra hour of television per day, there was a 2-3 fold higher odds of developing obesity (Stettler, Signer, & Suter, 2004).

Another parental behaviour which has also been shown to have influence on childhood obesity is maternal smoking history especially during pregnancy. A cohort study conducted in Germany reported that maternal smoking during pregnancy was an independent risk factor for overweight/obesity in children with a considerable odds ratio of 1.43 and 2.06 for overweight and obesity respectively (Von Kries, Toschke, Koletzko, & Slikker 2002). Exposure to prenatal smoking was found to increase the risk of excess weight gain in children even after cofounding for sociodemographic characteristics of parents, BMI, gestational weight gain, infant feeding and child behaviours (Oken, Levitan, & Gillman, 2008).

The mechanism by which prenatal smoking influences childhood obesity perhaps has not been fully understood. Nicotine and carbon monoxide which are the two most active substances in tobacco products are transported across the placenta may induce

vasoconstriction and hypoxemia leading to intrauterine growth restriction which probably explains the initial low birth weight of babies born to smoking mothers. However, postpartum nicotine withdrawal results in over feeding and weight gain in early years (Chen, Pennell, Klebanoff, Rogan, & Longnecker, 2005; Oken, Levitan, & Gillman,20

2.3. Conceptual framework

The conceptual framework for this study was developed after careful review of literature and contextualizing it to the setting of the secondary data and the objectives of the study. Factors associated with the development of overweight and obesity in children are multi- dimensional and for the purpose of this study included; Socio- demographic characteristic of mothers like age, educational level, household income and occupation have direct association with childhood obesity as well as influencing other factors such as environmental and behavioural to increase the chances of obesity.

Environmental factors comprises the setting in the home, and neighbourhood where a child lives and which also exert some influence on the development of obesity. Parental BMI and most importantly mother's BMI is a strong predictor and has been associated with childhood obesity. Behavioural factors consisting of some cultural influences, eating habits, breastfeeding practices sedentary lifestyles and maternal smoking habits creates a cascade of interactions influencing obesity in children.

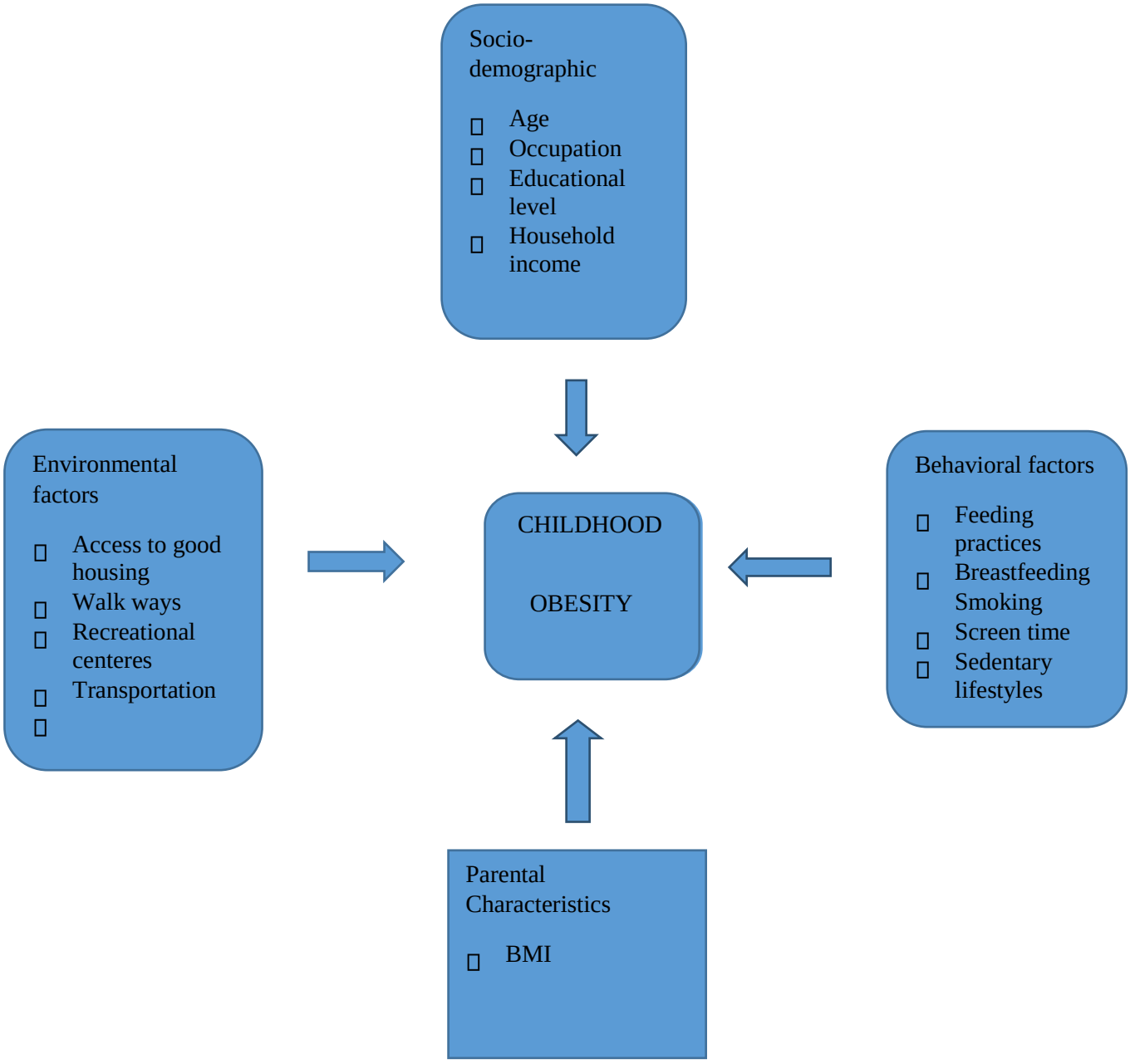

Figure 2.2: Conceptual Framework of modifiable factors associated with pediatric obesity (non-interventional). Source: Researchers Conceptualization of Study

2.4. Chapter Summary

The chapter has presented analysis of related literature on the key concepts underlying the study. It has demonstrated the factors that could associate with childhood obesity. The chapter has also presented the theory that could explain the behaviour of individuals to access a particular health intervention, which formed the choice of the conceptual

framework. The next chapter presents the methods applied to collect empirical data for analysis in this current study.

CHAPTER THREE

METHODS

3.0. Introduction

This chapter clearly outlines the methods that were followed to conduct this study. It provides information about the philosophical position of the researcher, study design and the justification for adopting that design, study area, study population, inclusion and exclusion criteria. It also describes the measureable variables (dependent and independent), data collection and sampling techniques and concludes with information on ethical issues considered by the researcher for this study.

3.1. Philosophical Position of the Researcher

The philosophical perspective of the researcher underpinning the study is from the positivists' view point of research (Haegele, & Hodge, 2015). The position of the positivists' is that reality in science is stable, and can be researched by measuring observable empirical facts without influence and personal opinion of the observer. For positivists, the essence of social reality is that: empirical facts exist apart from subjective opinions or ideas; defined by laws of cause and effect; social reality models are robust and awareness of them is constant (Crotty, 1998; Neuman, 2003; Marczyk, DeMatteo, Festinger, 2005).

3.2. Study Design

Analytical cross-sectional design was used employing quantitative methods in this study. A cross-sectional study design examines the prevailing features as a snapshot of a specific group of individuals at a specified stage in time and it is useful in determining prevalence or burden of disease in a given population (Mann, 2003). This design was applied because

analytical cross-sectional in addition to helping to determine the prevalence of obesity helped to determine association between identifiable risk factors and a disease or outcome. This form of study design has been adopted as it utilizes distinct groups of individuals who vary in the variable of concern but share other features such as socioeconomic status, educational level and ethnicity (Cherry, 2018). Some researcher explains that it can estimate the prevalence of all variables of interest; and multiple outcomes and exposures can be studied concurrently (Goldberg *et al*., 2013). However, this study design is restricted in its capacity to generalize conclusions about the relationship between a risk factor and health outcome (Levin, 2006).

Quantitative method describes variables, examine relationships among variables, and determine cause-and-effect interaction between variables (Gay, Mills, & Airasian, 2009). It is a systematic method to research in which numerical data are gathered and/or the investigator converts what is gathered or measured into numerical data. It often involves discovering facts that supports or contradicts a concept (Bryman, 2006).

The above strategies assisted the researcher to analyse the prevalence of obesity and factors associated among children under five years of age in Ghana using a national dataset accessed from the Ghana Statistical Service. The associations were quantified and statistically presented. This would not have been possible if the qualitative research method was adopted.

3.3. Study Area: Ghana – West Africa

The Republic of Ghana is a country centrally situated in West Africa along the cost of the

Atlantic oceans and Gulf of Guinea with an estimated total land size of 238, 535 square kilometers (GSS 2014). Ghana is bordered on the north by Burkina Faso, Togo on the east, and Côte d'Ivoire on the west. Ghana is a multi-ethnic country with an estimated population of 30 million with average growth rate of 2.5% in 2018 (WDI, 2018). Key pediatric health indicators has seen some improvement in Ghana in recent times. Ghana has excelled over the years to reduce the under-five mortality rate, which witnessed an impressive decline in mortality from 202 to 49 per 1,000 live births between 1968 and 2017 respectively (UNICEF 2017).

Even though the progress is significant and represent a 58% decline of mortality in children under five, it did not achieve the Millennium Development Goal (MDG) 4 target (40 deaths per 1,000 live births) (UNDP, 2019). The neonatal period or the first 28 days of life is the most critical period for a child's survival as most infant mortalities occurs during this period. Neonatal death represents 71% of infant's death and 48% of child mortality, and at present stands at 29 out of 1,000 live births (WHO, 2018).In Africa region, the risk of a child dying before their first birthday is highest compared with other regions and between 1990 and 2014, the rate of infant mortality in Ghana reduced significantly from 66 to 41 per 1000 live birth respectively (WHO, 2015).

3.4. Subjects/Study Population

A description of the study population provided by the Ghana Statistical Service (2014) was that a total of 12,831 households were selected for the survey, of which 12,010 were occupied. Out of the occupied households, 11,835 were successfully interviewed. 9,656 eligible women were identified for individual interviews in the interviewed households. Interviews with 9,396 females were concluded, giving a 97% response rate.

In the subsample of households selected for the male survey, 4,609 eligible men were identified and 4,388 were successfully interviewed. The study population included 3118 both male and female children under age five whose anthropometric data and other characteristics were captured in the male subsample household of the male survey in the Ghana Demographic and Health Survey (GDHS) (GSS, 2014).

3.4.1. Inclusion Criteria

The inclusion criteria used by the Ghana Statistical Service (2014) in the Ghana Demographic and Health Survey were eligible women, and children aged 0-59 months in the subsample of households selected for the male survey (half of all households) whose anthropometric data (weight and height) were correctly captured and coded in the Ghana Demographic and Health Survey (GDHS) of 2014.

3.4.2. Exclusion Criteria

The exclusion criteria used by the Ghana Statistical Service (2014) in the Ghana Demographic and Health Survey were: All children above age five captured in the dataset and those below the age of five without measured anthropometric data; and women not in the subsample selected for the male survey.

3.5. Sampling Method

A multistage sampling method was applied in the selection of study participants by the Ghana Statistical Service (2014) in the Ghana Demographic and Health Survey as explained below.

Firstly, a stratified sampling (Lavrakas, 2008) was used to sample children from the various age groups: 0-5 years, 6-10 years, and 11 -15 years into different strata. Lavrakas (2008) inform that in stratified sampling, participants are divided into various sub-groups (strata) sharing common characteristics like age, sex, race, income, education, and ethnicity.

Secondly, a random sample was applied to select a sample taken from each strata based on the defined characteristics (Acharya, Prakash, Saxena, & Nigam, 2013). Acharya *et al*. (2013) note that the advantages are that, it assures representation of all groups in the population needed since the characteristics of each stratum could be estimated and comparisons could be made. It also reduces variability from systematic sampling. However, these researchers observe that the limitations are that, it requires accurate information on proportions of each stratum; and also stratified lists are expensive to prepare (Acharya *et al*., 2013).

Thirdly, for the purpose of this study, total population sampling was used to include all the 3118 children between 0-59 months old in the subsample household for the male survey (Ghana Statistical Service, 2014). A total population sampling (TPS) is a technique where the entire population that meet the criteria (e.g. specific skill set, experience, among others) are included in the research being conducted (Etikan, Musa, & Alkassim, 2016). Etikan *et al*. (2016) indicate that a total population sampling is more commonly used where the number of cases being investigated is relatively small. These were among the reasons that informed the choice of this sampling method in this present study as well.

3.5.1. Sample size determination

There was no need to determine the sample size since a total population sampling was applied to select the 3118 children between ages 0-59 months for this study (Etikan *et al*., 2016).

3.6. Variables

The variables that were measured in this study were grouped into dependent and independent as shown below.

3.6.1. Dependent Variable

The dependent variable was obesity. This was measured using weight for height measurement based on the WHO standard growth chart used to identify overweight and obesity in children under age 5 years.

3.6.2. Independent Variables

The independent variables were:

1. Socio-demographic/economic characteristics of parents: Age, ethnicity, occupation of parent, level of education, household wealth.
2. Environmental factors: Toilet facility,
3. Behavioral factors: Breastfeeding duration, and other feeding practices, weaning, frequency of television watching
4. Predisposition factors: mother's BMI

3.7. Data Collection

Data for the study was accessed from the Ghana Statistical Service in the month of March April, 2019; and analysis took place between May and June, 2019. This study used

secondary data source. Hence, the researcher was not directly involved in administering or collection of data from respondents. A digital SECA 878 scale intended for child and adult weighting was used to measure weight. Height readings were performed using a measuring board from Shorr Productions. Children below 24 months were measured lying horizontally on a hard surface in a recumbent position and height was measured in a standing position for older children (GSS, 2014)

Permission was granted by the Ghana Statistical Service for access to the needed data in STATA format. A structured extraction sheet was developed and used to retrieve variables needed from the secondary dataset of the Ghana Demographic and Health Survey 2014 (GSS, 2014) for this study. This structured datasheet was used to extract data (sociodemographic, environmental, behavioural, and parental predisposition factors) from the dataset on 3118 children under age five in Ghana and corresponding variables of their mothers. Of a particular importance was the weight for height measurement based on the WHO standard growth chart used to identify overweight and obesity in children under age 5 (WHO Multicentre Growth Reference Study Group, 2006).

Overweight and obesity was defined as weight for height Z score of more than 2 standard deviations and more than 3 standard deviation respectively.

3.7.1. Data management and analysis

The dataset was analyzed with STATA version 15.0 using multivariate logistic regression to test the strength of association between the dependent and independent variables. These models allow for simultaneous analysis of the effects of independent variables on the outcome variable (Bender, & Grouven, 1997). Logistic regression model is a statistical

method for analyzing a dataset in which there are one or more independent variables that determine an outcome (Hosmer, Lemeshow, & Sturdivant 2013). One of the main advantages of logistic regression is the ability to use continuous explanatory variables making it easier to handle more than two explanatory variables simultaneously (Spreader, 2014).

In this analytical strategy, the outcome was measured with a dichotomous variable (in which there were only two possible outcomes) (Hosmer, Lemeshow, & Sturdivant 2013). Logistic regression aim to find the best fitting model to describe the association between the dichotomous characteristic of interest (outcome variable) and a set of independent variables (Long, 1997)

3.8. Validity and Reliability

Validity in quantitative research assesses if the study actually measures what it was meant to evaluate or whether the findings are genuine. Investigators usually determine authenticity by questioning a number of issues and will often look for clues in other studies (Joppe, 2000). The consistency of an instrument to produce same result when used repeatedly under similar condition constitute the reliability of the test instrument (Csikszentmihalyi, & Larson, 2014).

3.9. Ethical Considerations

Not all the ethical issues involved in the conduct of a study involving human subjects were applicable as this study was based on a secondary dataset. Therefore, the applicable considerations were applied as explained below.

Ethical Clearance

Ethical clearance was granted by the Local Ethics Review Committee of the Ministry of Health / Ghana Health Service (MOH/GHS) as it is a requirement for researchers who conduct research in a health facility. However, this study was not conducted in any health facility by the researcher as a secondary dataset was accessed from the Ghana Statistical Service. The need to seek ethical clearance arose to fulfil international research ethics requirements. The ethical clearance number was: GHS- ERC 063/04/19

Approval from Study Area

A letter of introduction, seeking permission to access the dataset at the Ghana Statistical Services was sent by the Head of Department (HOD), Health Policy, Planning and Management (HPPM), School of Public Health (SPH), College of Health Sciences (COH), University of Ghana (UG).

Confidentiality

The acquired dataset would not be used for any intent other than the study planned. The data shall not be copied or disclosed directly or indirectly to any other person or organization without the written consent of the Ghana Statistical service or her representative.

3.10 Description of Subjects Involved in the Study

The study involved dataset of all the children under age five (5) years and their parents in the subsample as captured in the Ghana Demographic and Health Survey (GDHS) (Ghana Statistical Service, 2014).

Potential Risks and Benefits

There was no anticipated risk to the participants whose data was used for the purpose of this study. The findings and information from this study would be beneficial in the long run as it would heighten the awareness and interest of policy makers to pay more attention to factors contributing to the development of childhood obesity in Ghana.

Data Storage and Usage

Participants whose data was used for the purpose of Ghana Demographic and Health Survey (GDHS) were assured that the information gathered would be kept by the Ghana Statistical Service. In the same light, this researcher also assured that the data would be used to assess the determinants of childhood obesity to inform policy makers and raise preventive awareness campaign to reduce its prevalence. The data would be stored on devices such as compact discs (CDs) and memory sticks for reference purposes. The data would be discarded after a period of five years.

Conflict of Interest

The researcher declares that there was no conflict of interest to disclose.

Funding Information

The total cost of funding for the entire research was borne by the researcher.

Dissemination of findings

The research findings will be made known to the Ghana statistical services and other relevant stake holders. It will also be made available for academic purposes in seminars and workshops.

3.11. Budget Justification

The budget covered the cost of stationary, which was estimated at GHS100 for printing the dissertation at various stages of the work, transportation and other unforeseen cost that were incurred in the course of the study.

3.12. Chapter Summary

This chapter has presented the methods that were adopted to collect data for analysis in this study. The chapter has explained how the choice of the quantitative research method was influenced by the researcher's philosophical position as a positivist. The ethical issues applicable to this study that used a secondary dataset have been explained as well. The next chapter presents the results from the analysis.

CHAPTER FOUR

RESULTS

4.0. Introduction

This chapter presents the results as obtained from the data collected and analysed. The chapter is divided into sections. Section one presents the socio-demographic characteristics of mothers and children under age five (5) used for the analysis. Section two presents the nutritional status of the children under five. Section three presents the prevalence of childhood obesity. Section four presents association between socio-demographic characteristics of mothers of children under age five and their (child's/children's) obesity status. Section five presents the association between environmental factors and obesity in children under age five. Section six presents the association between behavioural factors and obesity in children under age five. Section seven presents the logistic regression of the determinants of childhood obesity among children 0-59 months using adjusted and unadjusted ratios. Section eight presents the chapter summary.

4.1. Socio-demographic characteristics of mothers and children (aged 0-59 months)

Tables 4.1a to 4.1c present socio-demographic characteristics of children aged 0 to 59 months and their mothers. A total number of 2782 children under five years were sampled from the 2014 Ghana Demographic and Health Survey. The mean age was 27.88 months (±17.16). Most of the children belonged to age group 12-23 months, (21.4%) and 24-35 months, (20.2%). Slightly more than half of the children were females, (51.9%). A larger proportion (40.8%) of the children had birth order 4 and more.

Table 4.1a: Socio-demographic characteristics of mothers and children (aged 0-59 months) (N= 2782)

Variable	Frequency (n)	Percentage (%)
Mean age in months (SD)	27.88 (±17.16)	
Age (in months)		
<6	331	11.9
6-11	293	10.5
12-23	594	21.4
24-35	562	20.2
36-47	511	18.4
48-59	491	17.7
Sex		
Male	1444	51.9
Female	1338	48.1
Birth order		
1	598	21.5
2	572	20.5
3	478	17.2
4+	1134	40.8
Breastfeeding status		
Ever breastfed	1639	58.9
Never breastfed	24	0.9
Currently breastfeeding	119	40.2
Maternal characteristics		
Age		
15-19	101	3.6
20-24	466	16.8
25-29	694	24.9
30-34	663	23.8
35-39	522	18.7
40-44	252	9.1
45-49	84	3.0

Source: Field Data (2019).

Larger proportion (58.9%) of the children had ever breastfed and (40.2%) were currently breastfeeding. For maternal age, largest proportion of the mothers were aged 25-29 years,

(24.9%) and 30-34 years, (23.8%). Most, (40.1%) of the mothers had attained Senior High School and (35.7%) had no formal education.

Table 4.1b: Socio-demographic characteristics of mothers and children (aged 0-59 months)

Variable	Frequency (n)	Percentage (%)
Mean age in months (SD)	27.88 (±17.16)	
Age (in months)		
Educational Level		
No education	994	35.7
Primary	576	20.7
Senior High	1114	40.1
Highest	98	3.5
Maternal occupation		
Unemployed	489	17.6
Professional/technical/managerial	119	4.3
Agricultural	918	33.1
Sales and service	891	32.3
Skilled manual	326	11.7
Unskilled manual	29	1.0
Religion		
No religion	121	4.4
Christian	1953	70.2
Islam	591	21.2
Traditional	117	4.2
Ethnicity		
Akan	1071	38.5
Ga	111	4.0
Ewe	313	11.3
Guan	73	2.6
Mole-Dagbani	727	26.1
Grusi	129	4.6
Gurma	279	10.0
Mane	34	1.2
Other	45	1.6

Source: Field Data (2019).

Regarding occupation, most of the mothers were engaged in sales and services, (32.3%), followed by agriculture (33.1%) and (17.6%) of the mothers were unemployed. Majority, (70.2%) of the mothers were Christians and (21.2%) were Muslims. Most of the mothers were Akan, (38.5%) and (26.1%) were Mole-Dagbani. The wealth index of the mothers indicated that, most (72.4%) of the mothers had middles and (53.5%) belonged to the poorer wealth-index group.

Table 4.1c: Socio-demographic characteristics of mothers and children (aged 0-59 months)

Variable	Frequency (n)	Percentage (%)
Mean age in months (SD)	27.88 (±17.16)	
Age (in months)		
Wealth Index		
Poorest	904	32.5
Poorer	583	53.5
Middle	527	72.4
Richer	423	15.2
Richest	345	12.4
Region		
Western	286	10.3
Central	293	10.5
Greater Accra	218	7.9
Volta	218	7.9
Eastern	242	8.7
Ashanti	277	10.0
Brong Ahafo	320	11.5
Northern	438	15.7
Upper East	257	9.2
Upper West	233	8.4

Source: Field Data (2019).

The most (11.5%) represented region was Brong Ahafo Region, followed by Central Region (10.5%) and then Western Region (10.3%).

4.2. Nutritional status of children aged 0-59 months

The results in Table 4.2 presents the nutritional status of children aged 6 to 59 months.

-Most, (87.7%) of the children had normal weight for age, followed by children moderately wasted, (8.8%) and severely wasted, (1.9%). Most, (92.9%) of the children had normal weight for height and (3.9%) were moderately underweight. Regarding stunting, most, (92.9%) of the children had normal height for age and (3.9%) were moderately stunted.

Table 4. 2: Nutritional status of children aged 0-59 months

Nutritional status	Frequency N= [2782]	Percentage (%)
WFA Z-score (Wasting)		
Normal	2439	87.7
Moderate wasted	245	8.8
Severely wasted	53	1.9
Overweight	25	0.9
Obese	20	0.7
WFH Z-score (Underweight)		
Normal	2585	92.9
Moderate underweight	109	3.9
Severely underweight	24	0.9
Overweight	51	1.8
Obese	13	0.5
HFA Z score (Stunted)		
Normal	2585	92.9
Moderate stunted	109	3.9
Severely stunted	24	0.9
Overweight	51	1.8
Obese	13	0.5

Source: Field Data (2019).

4.3. Prevalence of obesity/overweight in children aged 0-59 months

Figure 4.1 presents the prevalence of obesity among children under five years. Out of the 2782 children, 3% was obese/overweight while 97% was normal/underweight.

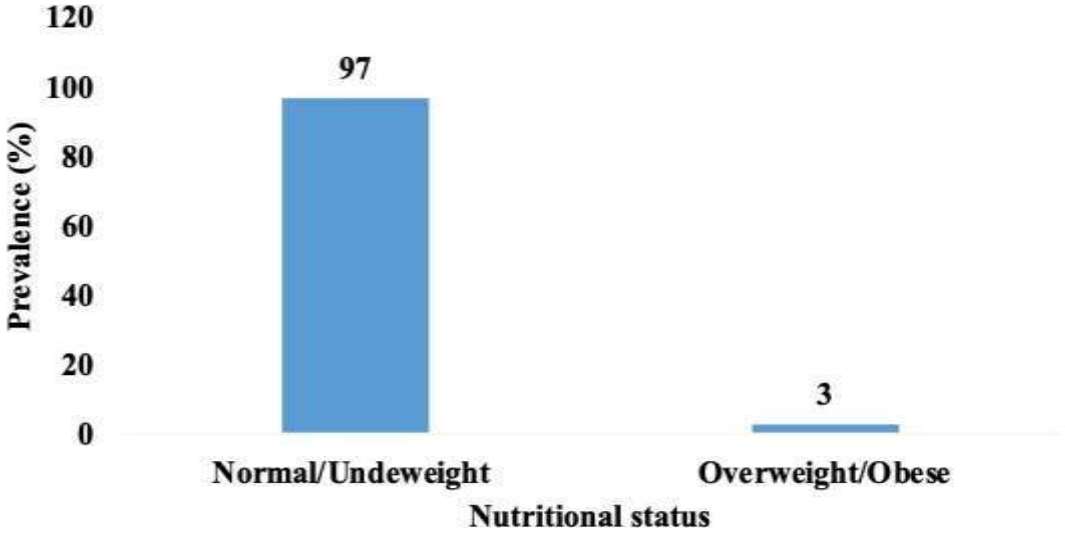

Figure 4.1: Prevalence of obesity/overweight among children

Source: Field Data (2019).

4.3.1. Regional prevalence of obesity among children 0-59 months

Figure 4.2 presents the regional prevalence of obesity among children under five years. Children from the Central Region (5.3%) and Greater Accra (5.3%) had high prevalence of obesity.

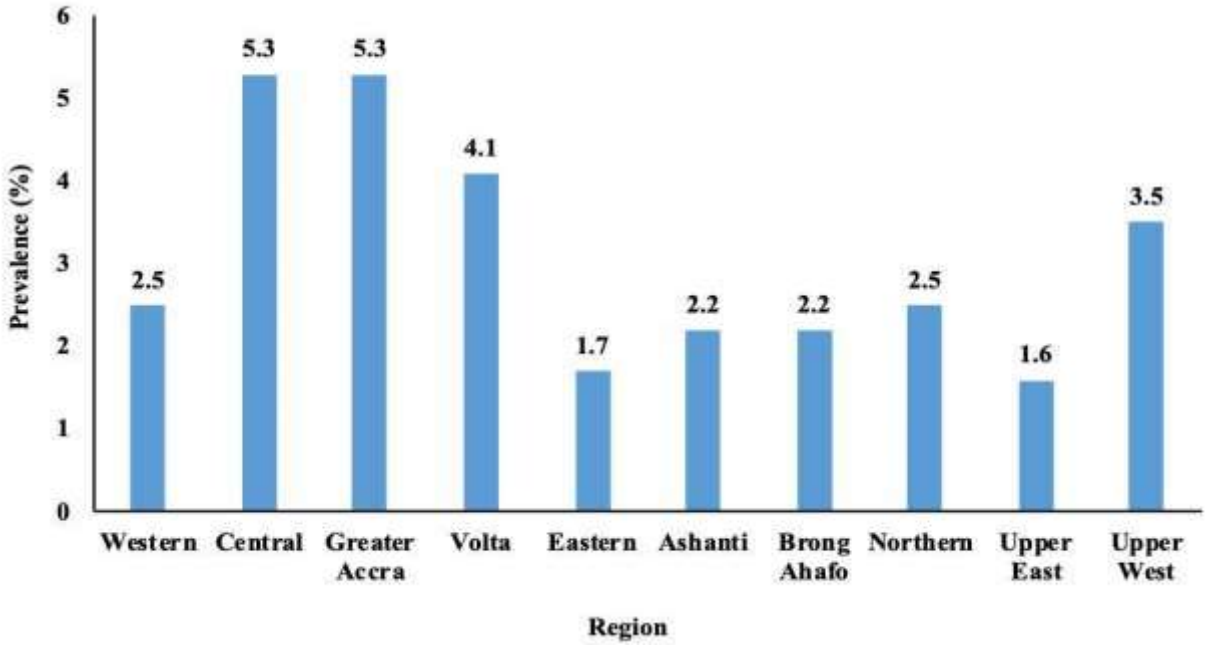

Figure 4.2: National prevalence of obesity among children 0-59 months

Source: Field Data (2019).

4.3.2. Prevalence of obesity among children 0-59 months by sex

Figure 4.3 presents the prevalence of obesity among children under five years by sex. Whereas the prevalence of obesity among males was 4.1% and females was 1.8%.

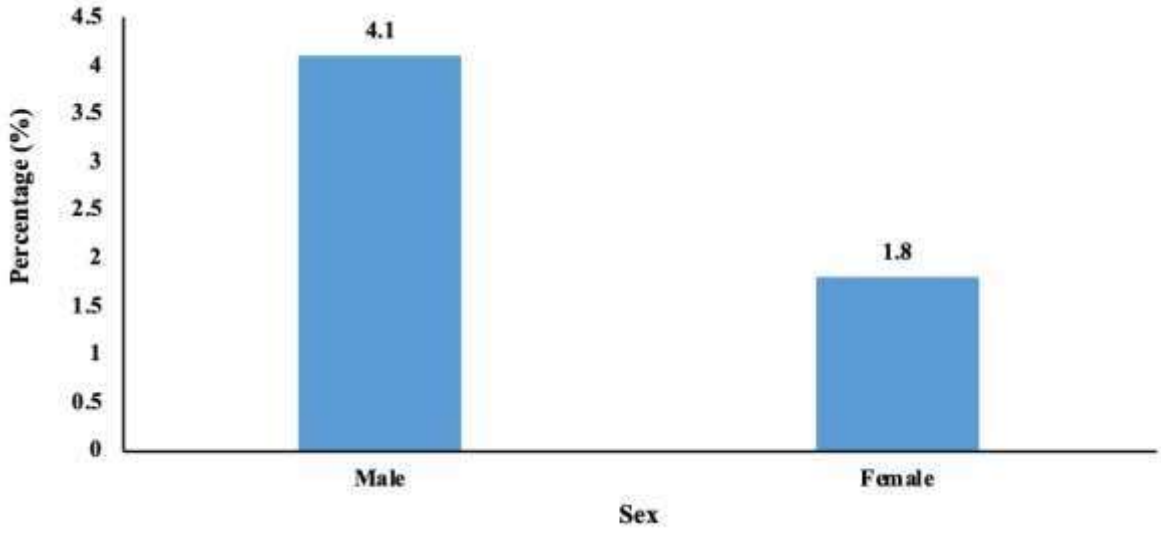

Figure 4.3: Prevalence of obesity among children under five by sex

Source: Field Data (2019)

4.4. Association between socio-demographic characteristics of mothers of children under five years and childhood obesity

The results in Table 4.3 show the association between socio-demographic characteristics and BMI of mothers of children under age five and their obesity status. There was a significant association between mothers BMI (χ^2 =23.96), p<0.001, α=0.05) and obesity status of children under five. However, insignificant association between mother's age and educational level, child rank, place of residence, and wealth index and obesity status of children under age five.

Table 4.3: Association between socio-demographic characteristics and predispositions of mothers of children under five years and childhood obesity

Variable	Normal/Underweight	Obese/Overweight	Chi-square (p-value)
Maternal characteristics			
Age (years) 15-19	94 (3.5)	6 (7.3)	
20-24	456 (17.2)	8 (9.8)	
25-29	660 (24.9)	17 (20.7)	
30-34	635 (23.9)	18 (21.9)	
35-39	495 (18.6)	17 (20.7)	
40-44	237 (8.9)	11 (13.4)	
45-49	79 (3.0)	5 (6.1)	10.84 (0.093)
Educational Level			
No education	956 (36.0)	26 (31.7)	
Primary	552 (20.8)	15 (18.3)	
Senior High	1059 (39.9)	35 (43.7)	
Higher	89 (3.4)	6 (7.3)	4.41 (0.221)
Child Rank			
1	569 (21.4)	17 (20.7)	
2	553 (20.8)	12 (14.6)	
3	450 (16.9)	16 (19.5)	
4+	10884 (40.8)	37 (45.1)	2.16 (0.539)
Place of Residence			
Urban	1056 (39.8)	40 (48.8)	
Rural	1600 (60.2)	42 (51.2)	2.69 (0.101)
Wealth Index			
Poorest	875 (32.9)	20 (24.4)	
Poorer	559 (21.1)	22 (26.8)	
Middle	505 (19.0)	12 (14.6)	
Richer	394 (14.8)	13 (15.9)	
Richest	323 (12.2)	15 (18.3)	6.32 (0.176)
BMI			
Normal	1589 (59.8)	45 (54.9)	
Underweight	139 (5.2)	7 (8.5)	
Overweight	622 (23.4)	8 (9.8)	
Obese	306 (11.5)	22 (26.8)	23.96 (<0.0001)

Source: Field Data (2019)

4.5. Association between environmental factors and childhood obesity

The results in Table 4.4 show the association between some environmental factors and obesity among children under five years. There was no significant association between main roofing material and childhood obesity (χ^2 =6.62, p=6.62, α=0.05). However, there was a significant association between type of toilet facility and childhood obesity (χ^2 =15.67), p=0.016, α=0.05).

Table 4.4: Association between environmental factors and childhood obesity

Variable	Normal/Underweight	Obese/Overweight	Chi-square (p-value)
Type of toilet facility			
Pit latrine with slap	430 (16.2)	8 (9.8)	
Flush toilet	318 (12.2)	20 (24.4)	
Open defecation	846 (31.6)	29 (35.3)	
Bucket toilet	3 (0.1)	0 (0.0)	
KVIP	786 (29.6)	21 (25.6)	
Pit latrine without slap	212 (8.0)	4 (4.9)	
Not a dejure resident	61 (2.3)	0 (0.0)	15.67 (0.016)
Main roofing material			
Thatch	247 (9.3)	5 (6.1)	
Rustic mat	9 (0.3)	0 (0)	
Bamboo	38 (1.4)	0 (0)	
Metal	723 (27.2)	0 (0)	
Wood	4 (0.1)	23 (28.1)	
Tiles	16 (0.6)	0 (0)	
Cement	27 (1.0)	0 (0)	
Roofing shingles	83 (3.1)	3 (3.6)	
Asbestos	1148 (54.5)	51 (62.2)	
Not a dejure resident	61 (2.5)	0 (0.0)	6.62 (0.761)

Source: Field Data (2019).

4.6. Association between behavioural factors and obesity among children aged 0-59 months

The results in table 4.5 show the association between behavioural factors and obesity among children under five years. There was no significant association between frequency of watching television, breastfeeding status, consumption of fortified foods, consumption of legumes, and consumption of other semi solid foods and obesity of children aged 0 to 59 months (p>0.05).

Table 4.5: Association between behavioural factors and childhood obesity

Variable	Normal/Underweight	Obese/Overweight	Chi-square (p-value)
Frequency of watching television			
Do not watch	1028 (38.7)	31 (37.8)	
Less than once a week	589 (22.2)	20 (24.4)	
At least once a week	1039 (39.1)	31 (37.8)	0.23 (0.893)
Breastfeeding status			
Ever breastfed	1578 (59.4)	41 (50.0)	
Never breastfed	23 (0.9)	0 (0.0)	
Currently breastfeeding	1054 (39.7)	41 (50.0)	4.01 (0.134)
Gave child fortified baby food No			
	1505 (90.7)	51 (85.0)	
Yes	154 (0.3)	9 (15.0)	2.20 (0.138)
Gives child legumes			
No	1482 (89.3)	53 (88.3)	
Yes	178 (10.7)	7 (11.7)	0.05 (0.817)
Gave child other semi-solid food			
No	1237 (74.5)	42 (70.0)	
Yes	423 (25.8)	18 (30.0)	0.62 (0.431)

Source: Field Data (2019).

4.7. Logistic regression: Factors associated with obesity among children aged 0-59 months (adjusted and unadjusted ratios)

This section presents the results of the logistic regression of the determinants of childhood obesity among children aged 0-059 months. There are two sub-sections: one for the unadjusted ratio and the other for adjusted ratio.

4.7.1. Logistic regression: Factors associated with obesity among children aged 059 months (unadjusted ratio)

This sub-section presents results of the logistic regression of the determinants of obesity among children aged 0-59 months using the unadjusted ratios. The results in Tables 4.6a to 4.6c show that, children who belonged to mothers aged 20-24 years were 73% less likely to be obese compared with children of mothers aged 15-19 years [COR=0.27(95% CI: 0.09-0.81); p=0.019] and the difference was statistically significant. Children who belonged to mothers in the richest wealth index were 2.03 times more likely to be obese as compared with children of mothers in the poorest wealth index [COR=2.03(95% CI: 1.024.01); p=0.041]. Children whose mothers were overweight were 54% more likely to be obese as compared with children whose mothers had normal body weight [COR=0.46(95% CI:0.21-0.98); p=0.047] and was statistically significant.

Children who belonged to obese mothers were 2.58 times more likely to be obese as compared with children of mothers who had normal body weigh [COR=2.58(95% CI: 1.53-4.38); p<0.001] and was however, statistically significant. Children aged 24-35 and 48-59 months were 63% and 66% less likely to be obese as compared with children <6 months [COR=0.37(95% CI: 0.16-0.84); p=0.013] and [COR=0.34(95% CI: 0.14-0.81); p=0.041] respectively and were statistically significant. Females were 57% less likely to

be obese compared with males [COR=0.43(95% CI: 0.26-0.71); p<0.001] and was statistically significant.

Table 4.6a. Logistic regression: Determinants of childhood obesity among children aged 0-59 months (unadjusted ratio)

Variable	Overweight/Obesity Unadjusted OR (95% CI)
Maternal characteristics	
Age	
15-19	
20-24	0.32 (0.10-0.96) 0.043
25-29	0.47 (0.17-1.27) 0.136
30-34	0.50 (0.18-1.39) 0.188
35-39	0.59 (0.21-1.63) 0.313
40-44	0.76 (0.25-2.29) 0.633
45-49	1.35 (0.37-4.92) 0.648
Wealth Index	
Poorest	
Poorer	1.71 (0.91-3.21) 0.095
Middle	1.08 (0.50-2.32) 0.826
Richer	1.34 (0.63-3.06) 0.413
Richest	1.70 (0.76-3.78) 0.189
BMI of mother	
Normal	
Underweight	1.59 (0.22-1.32) 0.182
Overweight	0.43 (0.19-0.95) 0111
Obese	2.33 (1.23-4.41) 0.009
Age (in months)	
<6	
6-11	0.54 (0.22-1.32) 0.182
12-23	0.78 (0.39-1.54) 0.480
24-35	0.32 (0.14-0.74) 0.008
36-47	0.59 (0.28-1.25) 0.171
48-59	0.27 (0.11-0.67) 0.005
Sex	
Male	
Female	0.43(0.26-0.71) 0.001

Table 4.6b: Logistic regression: Determinants of childhood obesity among children aged 0-59 months (unadjusted ratio)

Variable	Overweight/Obesity Unadjusted OR (95% CI)
Environmental factors	
Type of toilet facility	
Pit latrine with slap	
Flush toilet	3.38 (1.47-7.77) 0.004
Open defecation	1.84 (0.83-4.01) 0.130
Bucket toilet	1.11 (0.12-3.22) 0.345
KVIP	1.43 (0.63-3.27) 0.389
Pit latrine without slap	1.01 (0.30-3.40) 0.982
Not a dejure resident	2.01 (2.00-4.23) 0.901
Main roofing material	
Thatch	
Rustic mat	1.23 (0.34-55.55) 0.910
Bamboo	2.33 (2.01-2.44)0.459
Metal	0.11 (0.01-2.34) 0.203
Wood	0.43 (1.23-4.45) 0.234
Tiles	1.22 (0.11-2.92) 0.234
Cement	3.33 (3.12-4.32) 0.345
Roofing shingles	4.12 (0.34-33.4) 0.456
Asbestos	2.22 (0.33-1.34) 0.956
Not a dejure resident	0.23 (0.12-7.34) 0.895

Table 4.6c: Logistic regression: Determinants of childhood obesity among children aged 0-59 months (unadjusted ratio)

Variable	Overweight/Obesity Unadjusted OR (95% CI)
Behavioural factors	
Frequency of watching television	
Do not watch	
Less than once a week	1.12 (0.63-1.91) 0.684
At least once a week	0.98 (0.59-1.63) 0.967
Breastfeeding status	
Ever breastfed	
Never breastfed	1.23 (0.19-3.24) 0.643
Currently breastfeeding	1.49 (0.96-2.32) 0.072
Gave child fortified baby food	
No	
Yes	1.72 (0.83-3.57) 0.142
Gives child legumes	
No	1.11 (0.70-1.75) 0.632
Yes	
Gave child other semi-solid food No	
Yes	
	1.25 (0.71-2.20) 0.432

Source: Field Data (2019).

4.7.2. Logistic regression: Determinants of childhood obesity among children aged 0-59 months (adjusted ratio)

This sub-section presents results of the logistic regression of the determinants of obesity among children aged 0-59 months using the adjusted ratios. The results in table 4.7 show that, children who belonged to mothers aged 20-24 years were 68% less likely to be obese compared with children of mothers aged 15-19 years [AOR=0.32(95% CI: 0.10-0.96); *p*=0.043] and the difference was statistically significant. Children who belong to obese

mothers were 2.33 times more likely to be obese as compared with children of mothers having normal body weight [AOR=2.33 (95% CI: 1.23-4.41); *p*=0.009] and was however, statistically significant.

Children aged 24-35 and 48-59 months were 68% and 73% less likely to be obese as compared with children less than (<6) months [AOR=0.32(95% CI: 0.14-0.74); p=0.008] and [AOR=0.27 (95% CI: 0.11-0.67); p=0.005] respectively and the differences were statistically significant. Females were 57% less likely to be obese compared with males [AOR=0.43 (95% CI: 0.26-0.71); *p*<0.001] and was statistically significant. Children living in a household with flush toilet were 3.30 more likely to be obese compared with children living in households with pit latrine with slap [AOR=3.30 (95% CI: 1.07-6.87); *p*=0.034].

Table 4.7: Logistic regression: Determinants of childhood obesity among children aged 0-59 months (adjusted ratio)

Variable	Obese/Overweight Adjusted
Maternal characteristics	
Age	
15-19	
20-24	0.32 (0.10-0.96) 0.043
25-29	0.47 (0.17-1.27) 0.136
30-34	0.50 (0.18-1.39) 0.188
35-39	0.59 (0.21-1.63) 0.313
40-44	0.76 (0.25-2.29) 0.633
45-49	1.35 (0.37-4.92) 0.648
Poorest Poorer	
	1.71 (0.91-3.21) 0.095
Middle	1.08 (0.50-2.32) 0.826
Richer	1.34 (0.63-3.06) 0.413
Richest	1.70 (0.76-3.78) 0.189
BMI of mother	
Normal	
Underweight	1.59 (0.22-1.32) 0.182
Overweight	0.43 (0.19-0.95) 0111
Obese	2.33 (1.23-4.41) 0.009
Age (in months)	
< 6	
6-11	0.54 (0.22-1.32) 0.182
12-23	0.78 (0.39-1.54) 0.480
24-35	0.32 (0.14-0.74) 0.008
36-47	0.59 (0.28-1.25) 0.171
48-59	0.27 (0.11-0.67) 0.005
Sex	
Male	
Female	0.43(0.26-0.71) 0.001
Type of toilet facility	
Pit latrine with slap Flush toilet	
	3.03 (1.07-6.87) 0.034
Open defecation	1.28 (0.83-4.91) 0.141
Bucket toilet	1.30 (0.05-3.26) 0.485
KVIP	1.68 (0.67-3.28) 0.339
Pit latrine without slap	1.11 (0.10-3.49) 0.901
Not a dejure resident	1.01 (1.90-9.23) 0.893

Source: Field Data (2019)

4.8. Chapter summary

This chapter has provided analysis of the results of the empirical study conducted using a secondary dataset from the Ghana Statistical Service. The next chapter presents the discussion of these results as they relate to existing literature.

CHAPTER FIVE

DISCUSSION OF FINDINGS

5.0. Introduction

This chapter presents the discussion of the results obtained from the study in the previous chapter in relation to the study objectives. These findings have been related to existing literature. The chapter is divided into sections. Section one presents the sociodemographic characteristics of mothers and children (aged 0-59 months). Section two presents the prevalence of obesity in children under five years. Section three presents the environmental factors and childhood obesity. Section four presents the behavioural factors and obesity among children aged 0-59 months. Section five presents the mothers' preconception predispositions and obesity among children under age five.Section six presents the chapter summary.

5.1. Socio-demographic characteristics of mothers and children (aged 0-59 months)

A cross sectional study conducted by Salama and Tayel (2018) among 500 preschool children aged 24-60 months in Egypt, found a prevalence of 23% based on BMI-for-age percentile. In this study, children aged 24-35 months and 48-59 months were 68% and 73% less likely to be obese as compared with children aged <6 months respectively (Tayel & Salama, 2018). However, some researchers studied sex-specific risks of childhood diabetes and concluded that risk of obesity was higher in male children than in female children (Li *et al*., 2017). The differences found among males and females could be due to differences in biological features and developmental stages.

5.2. Prevalence of obesity in children under five years

Several studies conducted on the prevalence of childhood obesity have discovered that over the last few decades, the prevalence of obesity has steadily increased (Seidell, &

Halberstadt, 2015). However, information on childhood obesity in Ghana is scarce. The findings from this study showed that the overall prevalence of obesity (BMI ≥ 95th percentile) among the 2782 children under five years was 3%. Jones and colleagues discovered a prevalence of 28.6% of obesity among same age group in the WHO European region, which comprised some 53 countries (Jones et al., 2017). In the USA, a study reported a prevalence of 10.4% in 2006 (Van Vrancken-Tompkins & Sothern, 2006).

In a study in Egypt, a prevalence of 19.5% was ascertained in a sample of 154 children (Hassan, El-Masry, Farid, & Khalil, 2016). The differences in the prevalence could be due to the differences in geographical location and the study population used. The prevalence of obesity reported among male children was 14.8% compared with 12.4% in female children (Li et al., 2017). This concur with findings of this study.

5.3. Environmental factors and childhood obesity

Physical environment situated within socioeconomic context of a child influences food intake and energy expenditure significantly (Affenito *et al*., 2012). Environmental factors are crucial in childhood obesity development (Bass, & Eneli, 2015). The findings of this research indicated that children who used flush toilets in their homes were thrice as likely to be obese in comparison with children without household toilet facility. The findings of this study is similar to the findings of a cross sectional study among urban population in Bangladesh (Das *et al*., 2013).

Das *et al*. (2013) showed that, children who used sanitary toilets were also more likely to be obese as compared with their counterparts. The results of this current study could

possibly be that, children who had access to sanitary toilets/flushing toilets were from high socio-economic background and therefore, enjoyed good meals as well as sweets and junk foods. The results from the study in Bangladesh also found a significant relationship between high socio-economic status and obesity in children (Das *et al*., 2013).

5.4. Behavioural factors and obesity among children aged 0-59 months

There was no significant association between behavioural factors such as watching television in this study. Several other studies agree to this finding (Aryeetey *et al*., 2017; Hassan *et al*., 2016). However, a study conducted in Pakistan stands in disagreement and argued that homes with television sets are because of good socio-economic status of parents, which is associated with adverse dietary and sedentary lifestyle suggesting the need to control childhood obesity at their early stage of development (Mushtaq *et al*. 2011). These researchers reported that obesity friendly behaviours and eating practices included skipping breakfast, consuming large portion sizes, high intake of poly-saturated fat, frequent patronage of fast food and increase intake of sugar beverages (Mushtaq *et al*, 2011).

The results of a study carried out to determine some behavioural factors associated with obesity found that, children who watched television for longer hours were more likely to be obese and this was more prevalent among females as compared with males (Suglia *et al*., 2013). Suglia *et al*. (2013) explained that the reason for the prevalence in obesity as a result of long hours of watching television could be due to the fact that, the children will be less engaged in physical activity and increase their intake of sweets and other beverages as they sit and enjoy the programme on the television. The increase in physical inactivity is prone to increase body mass and hence obesity.

5.5. Mothers' predispositions and obesity among children under age five

Findings from this study also suggest that children who belong to obese mothers were 2.33 times more likely to be obese as compared with their counterparts whose mothers were of normal weight. Similarly, Gaillard et al. (2016), asserted that a higher maternal pre-conception BMI and increased gestational age was associated with childhood obesity after delivery. Findings from this study suggest that children born to mothers between the ages of 20 and 24 were about 68% less likely to be obese than children born to mothers between the ages of 15 and 19 and the difference was statistically significant. Teenage pregnancy has been shown to be associated with a risk of maternal obesity (Chang, Choi, Richardson, & Davis, 2013). Pregnancy in itself predisposes women to maternal obesity. However, chances are higher in teen pregnancies (Chang et al., 2013).

5.6. Chapter summary

This chapter has discussed the results of the empirical study conducted as it relates to existing literature. The next chapter presents the conclusion of the study and recommendations for stakeholders.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.0. Introduction

This chapter presents the summary, conclusions and recommendations of the results obtained in the study. Section one presents the summary of the study. Section two presents the conclusions to the study. Section three presents the contribution to knowledge. Section four presents the recommendations, which provide suggestions of areas that are to be considered to improve the study, and to reduce the prevalence of obesity among children under five years of age. Section five presents the limitations to the study. Section six presents suggestions for future research.

6.1. Summary of study

The primary objective of the study was to assess the determinants of childhood obesity in children under five years in Ghana. The study used secondary data comprising 2782 children under five years who were sampled from the Ghana Demographic and Health Survey 2014 in the male subsample household. The study assessed the association between sociodemographic characteristics of mothers, environmental, behavioural, maternal predispositions and the development of childhood obesity. Generally, the study discovered that in Ghana, obesity was 3.0 percent among children under five years of age out of a total of 2782 children who were involved in the study. Among the ten regions of Ghana, the highest prevalence (5.3%) was recorded from the Central and Greater Accra Regions, followed by the Volta Region (4.1%) and Upper West Region (3.5%). The least recorded prevalence was in the Upper East Region (1.6%). A higher prevalence was recorded among male children (4.1%) than females (1.8%).

6.2. Conclusions of the study

This section presents the conclusions of the study based on the specific objectives relating to the association between socio-demographic characteristics of mothers, environmental, behavioural, maternal predispositions and the development of childhood obesity as presented below.

6.2.1. Socio-demographic characteristics of mothers and children (aged 0-59 months)

Children who were born to mothers aged 20-24 years were 68% less likely to be obese, compared to children born to mothers aged 15-19 years. Children aged 24-35 and 48-59 months were 68% and 73% less likely to be obese as compared with children less than (< 6) months.

6.2.2. Environmental factors and childhood obesity

The results of this study showed that, children who used flush toilets were three times more likely to be obese as compared with children without toilets at home. This finding was similar to the study carried out by Das et al. (2013) in Bangladesh who found that children who used sanitary toilets were also more likely to be obese as compared with their counterparts.

6.2.3. Behavioural factors and obesity among children aged 0-59 months

There was no significant association established between behavioural factors, including frequency of watching television and breastfeeding status, and children's obesity status. The results of this study is different from the results of a study carried out to determine some behavioural factors associated with obesity. They found that children who watched

television for longer hours were more likely to be obese and this was more prevalent among females as compared with males (Suglia et al., 2013).

6.2.4. Mother predispositions and obesity among children under age five

In this study, the association between mothers BMI and the obesity status of their children was significant after adjusting for other sociodemographic factors. In comparison with normal weights or underweight mothers, children born to obese mother were more prone to obesity. This was corroborated by a study in Sweden which reported that the chance of a child being obese is significantly increased if either parent was overweight or obese. (Lindkvist, Ivarsson, Silfverdal, & Eurenius, 2015). Bider-Canfield *et al.* (2017) in their cohort study concluded that maternal preconception obesity or overweight status and excessive weight gain during pregnancy were independently associated with an increased risk of childhood obesity.

6.3. Contribution to knowledge

World Health Assembly (WHA) in response to the alarming increase in childhood obesity and other forms of malnutrition endorsed a comprehensive implementation plan which aims at halting the increase in childhood obesity by 2025. The purpose of the policy is to increase attention to, investigate in, and action for a set of cost effective interventions policies. The findings of this present study contribute to knowledge by revealing the burden of childhood obesity among the study population investigated and its contributing factors which would help design a cost effective mechanism and interventions to help reduce childhood obesity

6.4. Recommendations of the study

The following recommendations have been made for consideration by policy makers, practitioners and mothers.

Policy Makers

Policy makers and other stakeholders in the child health environment Health policy makers, public health professionals and other stakeholders in the child health environment should put in place policies for implementation in communities, schools, offices, and other places of social gatherings to provide support and education on good breastfeeding and healthy eating practices. Policies on early growth monitoring of children (0-59 months) at child welfare clinics (CWC) should be well supervised and strengthen. CWC should be well resourced in terms of logistics and accurate anthropometric measuring instruments to provide reliable services. There is the need to intensify education on teenage pregnancy. Periodic counselling sessions should be implemented for this purpose.

Practitioners and management of health institutions

Health facilities who provide antenatal and postnatal services should provide education for mothers on the practice of exclusive breastfeeding. Public health professionals should provide families of children under five with education on the importance of healthy eating, including eating balanced meals. Public health professionals should implement and provide services that aim to educate mothers on the appropriate weight gain before and during pregnancy. It is essential to increase maternal dietary understanding through counselling and educational sessions to trigger adjustments in dietary behaviours as mothers have substantial influence on childhood obesity. The results underline the relevance of taking into consideration family risk factors and predispositions when

assessing the health of the child and BMI at regular CWC visits at an early age. Renewed attempts to improve management during pregnancy, essentially of blood glucose, and particular attention to postpartum weight management should be rendered to females who are already obese.

Mothers and families and School authorities

Communities and schools of children under five should be fitted with playgrounds to foster physical activity among the children. This should be considered alongside policies that would ensure safety with use of equipment that would be used in these playgrounds.

6.5. Limitations to the study

The study was beset with few limitations in terms of the use of secondary data and not primary data. The use of primary data would have brought out different responses. The other challenge to the study was that the sample size of children in Ghana used as at 2014 was different from the current number of children in Ghana. Thus, generalisation of the findings of the study should be considered with a bit of caution.

6.6. Future research

Based on the above limitations, this study suggests that future studies should focus attention on other factors such as genetics, and use of longitudinal studies, from primary data collection to know the current situation in selected or entire country. The use of a qualitative method to get explanations from mothers on the issues raised in the study will also enrich the study.

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